

PATENT SPECIFICATION



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COMPLETE SPECIFICATION.

Improved Process for Removing Gas Residues and for Purifying Inert Gases in Electric Vacuum Tubes, Incandescent Lamps and the like.

We, Dr. GILLES HOLST, a subject of the Queen of The Netherlands, Dr. ERKO OOSTERHUIS, a subject of the Queen of The Netherlands, and NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPEN-FABRIEKEN, a limited liability company, organised and established under the laws of the Kingdom of the Netherlands, all of Eindhoven, Netherlands, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to a process for removing gas residues and also for purifying inert gases in vessels such as electric vacuum tubes, incandescent lamps, electric discharge tubes, Röntgen tubes, audions or rectifiers.

It is known that the vapour of substances such as calcium, barium, strontium, potassium or sodium, combines with all gases, except inert gases to form combinations which have a very low vapour pressure, and this action is greatly accelerated by electrical discharges. In vacuum or discharging tubes all gases present or set free except inert gases will quickly disappear in the presence of such metals, so that a high vacuum or a very pure inert gas is obtained.

For this purpose it has been proposed to use heated alkali earth metals also in the form of alloys, such as magnesium calcium alloy.

It has also been proposed to use electrodes in discharge tubes composed of an alkali metal or an alkali metal alloy. In this case the alkali metal eventually absorbs gas residues, yet the principal

function of the alkali metal is to co-operate in the discharge and decrease the discharge potential. Therefore the cathode consists wholly or for a large part of the active metal and the action ceases when all the alkali metal of the electrodes is volatilised on the colder parts of the tube.

The present invention is a method of introducing alkali or alkali earth metals into electric vacuum tubes, incandescent lamps or electric discharge tubes, without making the electrodes of these metals and without these metals being vehicles of discharge.

This invention comprises a process for introducing alkali or alkali-earth metals into electric vacuum tubes, incandescent lamps or electric discharge tubes, in order to remove the gas residues or to purify inert gases, and is characterised by the fact that in the tube or the like an alloy of an alkali or alkali-earth metal with a nobler metal of lower vapour pressure is located at a place where a sufficiently high temperature is obtained to vapourise the alkali or alkali-earth metal, while the other component of the alloy does not vapourise perceptibly and the vapour of the alkali or alkali-earth metal does not co-act in the conduction of the current.

The expression "nobler metal" which is used herein, means that if two metals are placed in a suitable electrolyte, one becomes charged with positive electricity the other with negative electricity. The former metal is therefore more electro-positive than the latter, so that all metals may be placed in a series of increasing electro-positive power. The most electro-positive metals are the alkali metals, the

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least electro-positive metals are the noble metals such as gold, platinum, *etc.* Therefore "a nobler metal" is a metal that has less electro-positive properties and generally is much less chemically active, and resembles more or less in this respect the noble metals.

All ordinary metals, as magnesium, zinc, iron, nickel, tin, *etc.* are nobler than the alkali and alkali-earth metals.

As the sole object of the alkali or alkali-earth metals is to absorb small quantities of gases present or evolved, only very small quantities of these metals are necessary, because they may be used up when no more gases are set free.

As the other component of the alloy does not evaporate to any perceptible extent, it cannot blacken the bulb as would be the case if more volatile metals were used, such as magnesium.

When applying the process according to this invention care should be taken that the alloy is not located at places where the vapour of the alkali or alkali-earth metal acquired such a tension, that it would take part in the discharge.

The use of such alloys has several advantages. In the first place the active metal is protected by the nobler metal against oxidation, humidity and other influences. At the same time, the manipulation of these active metals becomes free from danger. A further advantage is, that the alloy may be introduced in the tube in a very simple manner. If, for instance, a tin alloy is used,

it may be applied in the manner of a solder upon one of the metal parts in the tube.

An alloy composed of tin with a small percentage of calcium is especially suitable.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A process of introducing alkali or alkali-earth metals in electric vacuum tubes, incandescent lamps or discharge tubes, in order to remove the last gas residues or to purify inert gases, characterised by the fact that in the tube or the like an alloy of an alkali or alkali-earth metal with a nobler metal of lower vapour pressure is located in the tube at a place where a sufficiently high temperature is obtained to vapourise the alkali or alkali-earth metal, while the other component of the alloy does not vaporise perceptibly and the vapour of the alkali or alkali-earth metal does not co-act in the conduction of the current.

2. A process according to Claim 1, in which a tin calcium alloy is used.

3. Electric apparatus when made according to the process claimed in Claims 1 or 2.

Dated this 21st day of September, 1920.

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IN - CHUNTONOV K A; KATAEV A A; MELEKHOV L Z

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PN - RU2056661 C1 19960320 DW199650 H01J9/12 006pp

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AB - RU2056661 A generator contains a current conducting casing with openings (1) for vapour outlet and filled with a working substance in the form of spherical lithium granules (3). The ends of the casings are closed and welded and the generator is mounted in the reinforcement of the instrument, before it is degassified at 250-480 deg.C. Exciting current is then passed and vapours of the alkaline metal are generated at a temp. of 500-700 deg.C. Halides of alkaline metals are used as the spherical granules with a protective gallium coating, applied in a cylinder with water, a heater and thermal insulation. The spheres acquire a gallium film and are passed into a collector. The water in the collector is held at a temp. of 0-10 deg.C, ensuring hardening of the gallium coating.

- USE - Used to form vapours of alkaline metals during prodn. of electro-vacuum instruments and photo-emission instruments.
- ADVANTAGE - The process is simplified.
- (Dwg.1/3)

IW - GENERATE ALKALINE METAL VAPOUR COATING SPHERE LITHIUM GRANULE GALLIUM
HEAT GRANULE SEAL METAL CASING OUTLET OPEN VAPOUR

IKW - GENERATE ALKALINE METAL VAPOUR COATING SPHERE LITHIUM GRANULE GALLIUM
HEAT GRANULE SEAL METAL CASING OUTLET OPEN VAPOUR

INW - CHUNTONOV K A; KATAEV A A; MELEKHOV L Z

NC - 001

OPD - 1993-08-23

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PAW - (SEVE-R) SEVER CO LTD

TI - Generation of alkaline metal vapour - includes coating of spherical lithium granules in gallium and heating of granules in sealed metal casing with outlet openings for vapour

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